ABSTRACT

Development of a Soft Electron b-tagger for Higgs Searches
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The Tevatron experiments, including the Collider Detector at Fermilab (CDF), may soon achieve the sensitivity necessary for finding evidence for or excluding the Higgs boson, the particle that is responsible for imparting mass to the fundamental constituents of matter. For a Higgs boson mass of approximately 120 GeV/c^2, which is favored by fits to precision electroweak data, the Higgs boson is expected to decay to a b quark and anti-b quark, each of which form b hadrons that result in jets of particles in the CDF detector. These can be identified by using special "b-tag" algorithms by reconstructing a displaced vertex from the long lifetime of the b hadron before it decays, or by identifying electrons or muons in the b hadron decay sequence. The Higgs group at CDF currently does not have an option for a soft electron b-tagger. This study uses Pythia Monte Carlo simulations of Higgs decays and jet data to evaluate the best algorithm for identifying the highest fraction of real b hadrons, while maintaining the lowest rate for misidentifying jets from light quark decay. In this analysis, we seek to develop a soft electron b-tagger, which can improve the number of Higgs boson candidate events that we can analyze, and therefore improve the sensitivity of the low-mass Higgs search program at CDF.